pituitary gland usually followed œstrogen treatment and a large hæmorrhagic adenoma of the anterior lobe was encountered in 2 rats during the first year of treatment. After longer periods, however, nearly all animals were found to have large pituitary adenomas.

Preliminary observations in a new series of animals suggest that tumours may occur when pellets are implanted in female rats 28 days of age, that they may be produced in male rats and after implantation of œstradiol pellets.

We wish to thank Mr. C. Larsen for his technical assistance in these experiments and Mr. K. Nielsen for taking the photographs.

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A NEW METHOD OF TREATMENT OF DEPRESSED FRACTURE OF THE ZYGOMATIC BONE*

BY HAMILTON BAXTER, M.Sc., M.D., D.D.S.

Montreal

FRACTURES of the zygomatic bone are becoming more frequent, largely due to the increasing number of motor accidents. The driver or passenger in the front seat is thrown forward by the impact of the collision, and the face is flung violently against the steering wheel or instrument panel with resultant severe injuries. Industrial accidents and injuries received on the playing field are responsible for many more such fractures. The zygoma occupies a prominent position among the bones of the face and bears the brunt of resistance to violence from many directions.

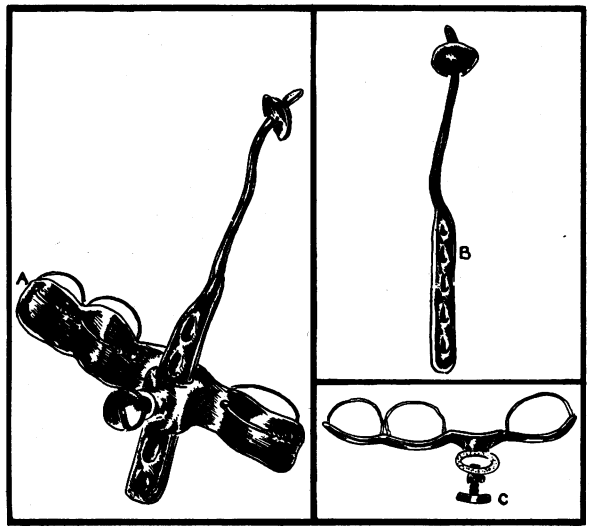


Fig. 1.—The splint in detail. The band (A) with a sleeve into which the prop is inserted. The prop (B) is longer than necessary to allow for adjustment in a vertical direction; any excess may be cut off. After the prop emerges from the sleeve it should lie close to but not touching the bone except at the distal end. The screw (C) inserted in the sleeve, when tightened, engages in one of the small holes drilled in the prop, thus maintaining the fractured bone in correct anatomical position until sufficient callus has formed to support it.

Anatomical features.—The zygoma is a quadrangular bone which contributes to the formation of the orbit, the prominence of the cheek, and parts of the temporal and infratemporal fossæ. It has four processes—temporal, frontosphenoidal, orbital and maxillary, and they articulate with four bones — frontal, sphenoidal, temporal and maxillary. To it are attached the masseter and temporal muscles and certain of the muscles of expression.

Signs and diagnosis.—Typical fractures of the zygoma are usually readily diagnosed due to the peculiar facies which results. There is a depression in the zygomatic and infraorbital regions on the affected side and a lack of expression. This is most evident before the traumatic effusion has developed or after it has subsided. Anæsthesia of the skin area supplied by the infraorbital nerve is frequently present. Normal movements of the jaw may be restricted by the depressed fragment which impinges upon the coronoid process of the mandible. Mobility and crepitus are rare, but by palpation abnormal irregularity of the orbital margin may be detected, and oral examination reveals an unnatural resistance to the finger passed up along the ascending ramus of the mandible. Diplopia may be present if there is much damage to the floor and margin of the orbit. A visual test and examination of the eye on the affected side should be made on admission and a note of the findings recorded. In a recent case a fragment of the orbital margin perforated the globe and it

* From the Department of Surgery, Royal Victoria Hospital, Montreal.

was necessary to have an enucleation performed. Unilateral epistaxis is often noted, and since the maxillary sinus is usually filled with blood an acute maxillary sinusitis may develop. Finally, conjunctival hæmorrhage and ecchymosis of the skin are frequently present.

In any case in which a fracture is suspected x-ray films should be taken to confirm the physical examination, to show the degree of displacement and type of fracture present, and to provide proof of the condition on admission to the hospital. Films taken in the maxillary sinus position and submento-vertex position are most satisfactory, although special studies may be necessary in unusual cases.

VARIETIES OF FRACTURE

1. Though the body of the zygomatic bone is compact and firmly constructed it rests on fragile supports, and for this reason the fronto-sphenoidal, orbital, maxillary and temporal processes are the usual sites of fracture. Thus the most common fracture is that in which the bone is separated from all its attachments and displaced *en masse*. While the trauma may be received from very divergent angles, the most frequent application of force is approximately at right angles, with displacement of the bone inwards and downwards into the maxillary sinus. In the course of the displacement the zygomatic bone acts as a hammer and crushes the frail anterior and posterior walls of the antrum. When this occurs the bone cannot be impacted in its original position due to lack of bony support and it sinks into the sinus as soon as the elevating instrument is removed. In this type of fracture many methods of treatment have been advocated but the most satisfactory is that in which the bone receives firm support until sufficient callus has bridged the fracture lines to maintain the zygoma in its anatomically correct position.

2. The next most common fracture is that in which the zygomatic arch receives the full force of the impact. Usually a portion of the arch is driven inwards and downwards.

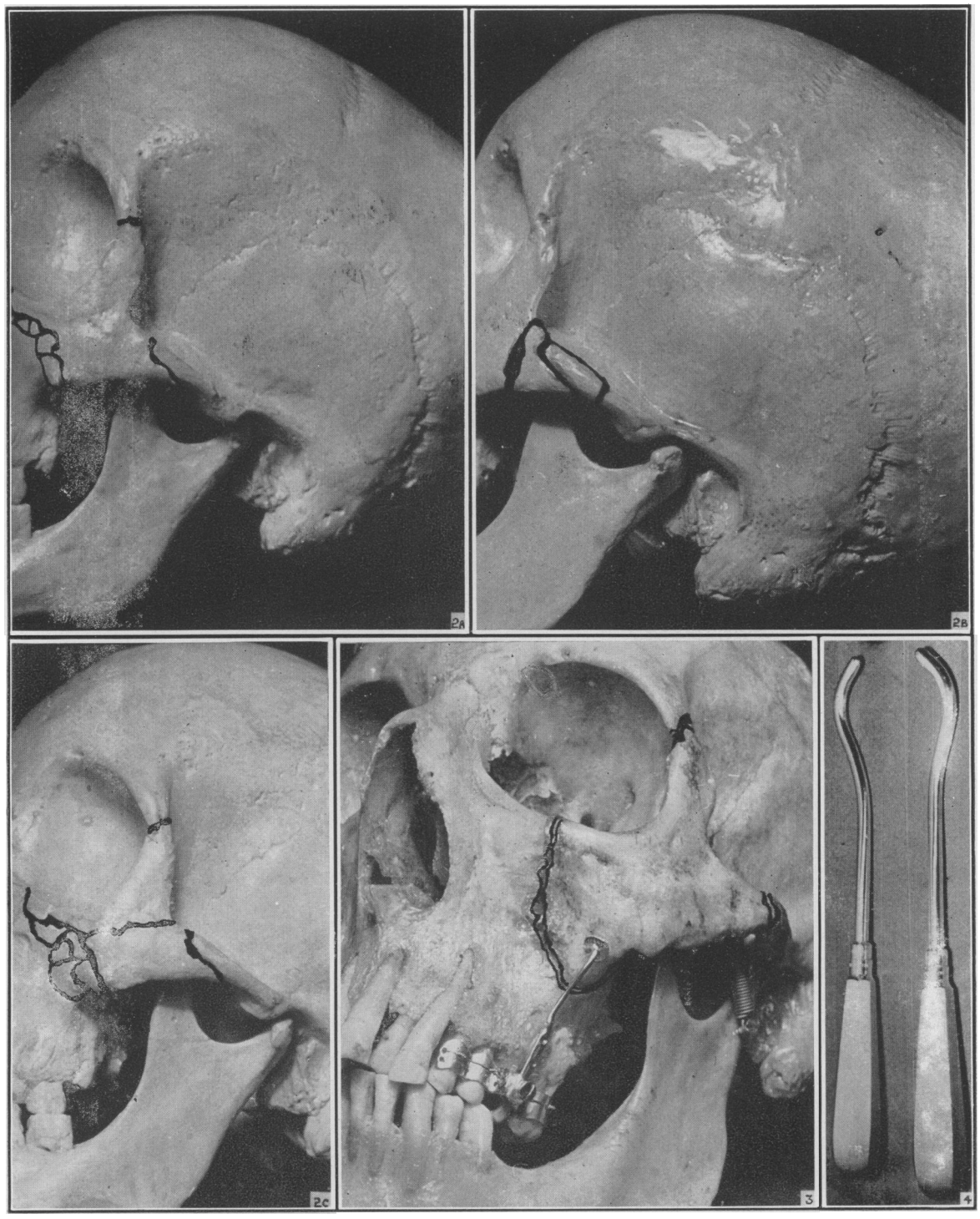
3. Finally, the zygoma may be comminuted and consist of two or more fragments. These may be displaced into the orbit, infratemporal fossa or maxillary sinus. Quite frequently when sufficient force has been applied to damage the bone so extensively there is a coexisting laceration of the skin which exposes the fragments to a varying degree and thereby facilitates treatment by permitting direct wiring of the bone.

TREATMENT

Many different methods of treatment have been suggested for depressed fractures of the zygomatic bone. The use of hooked forceps inserted through the skin; hooks, screws and elevators applied by means of external incisions in the skin or muco-buccal fold in the mouth have been recommended. Reduction of the fracture has been accomplished by elevators inserted into the maxillary sinus through the canine fossa or an intranasal window and packing of the sinus with gauze. Certain of these methods are applicable only to a specific type of fracture and others cause unnecessary scarring or danger of severe infection. Use of an unsuitable method in a given case may result in failure to obtain satisfactory reduction of the fractured bone, or, worse still, to maintain it in a normal position.

1. In the first type of fracture, in which the zygoma is separated from all its attachments and displaced *en masse*, usually downwards and medially into the maxillary sinus, certain methods of treatment are commonly used. The Gillies' method[1] of making a small incision in the temporal region within the hair line and passing an elevator downwards on the surface of the temporal muscle until it lies deep to the displaced bone may be used. By careful levering the bony mass may be elevated. Straith[2] uses a heavy antrum trochar which is passed through the oral mucous membrane above the last molar tooth and behind the zygoma. Upward traction on the trochar aided by external manipulation usually results in satisfactory reduction. Lothrop has described a method in which an incision is made in the muco-buccal fold and an elevator inserted into the antrum through the fracture line. The depressed bone is elevated and the maxillary sinus is firmly packed with iodoform gauze. This latter method has a distinct disadvantage in that a chronic maxillary sinusitis almost invariably develops.

If the bone can be impacted against the jagged margins of its attachments by any of these methods it will usually stay in place. However, as is often the case, if the anterior and posterior walls of the maxillary sinus are badly comminuted, or if reduction is delayed, the fragment slips back into its depressed position as soon as the elevator is removed. Under these circumstances it becomes necessary to provide a positive



Figs. 2A, 2B and 2C.—The three commonest types of fracture of the zygomatic bone and arch are shown in order of frequency. The new splint described is used in types A and C. **Fig. 3.**—The contoured band of splint containing a sleeve with an adjustable screw is wired to the teeth. A hole is drilled in a suitable part of the body of the zygomatic bone, about one-eighth of an inch deep. The prop is then passed through the sleeve and the upper end which carries a small round guard is inserted in the hole drilled in the zygoma. After the fragment has been elevated into its correct anatomical position the set screw is then tightened. **Fig. 4.**—These elevators are so shaped as to be most effective in elevating the fragments in a type B fracture of the zygomatic arch.

support to retain the fragment in an anatomically correct position until sufficient callus has formed to retain it.

For this purpose I have devised a metal splint* which is wired to the teeth on the same side as the fracture and supports the fragment until union has occurred (Figs. 1 and 3). An incision is made in the muco-buccal fold and the soft tissues in the canine fossa are elevated from the maxilla by blunt dissection until the fracture line and lower part of the zygoma are exposed. A small hole is drilled in a suitable part of the zygoma and a round wire prop of stainless steel is passed through a sleeve in the splint and pushed up until it engages in the hole previously drilled in the zygoma to receive it. An elevator is then slipped through the fracture line in the antral wall and the bone lifted into its normal position as determined by palpation and, if necessary, by x-ray. The prop is fixed solidly in position by tightening the set screw which is inserted in the sleeve of the metal splint. The incision is closed with interrupted sutures. If it is thought advisable, intranasal drainage of the antrum may be provided at this time. The appliance may be left in place for two to four weeks if necessary without causing undue reaction in the tissues (Fig. 5).

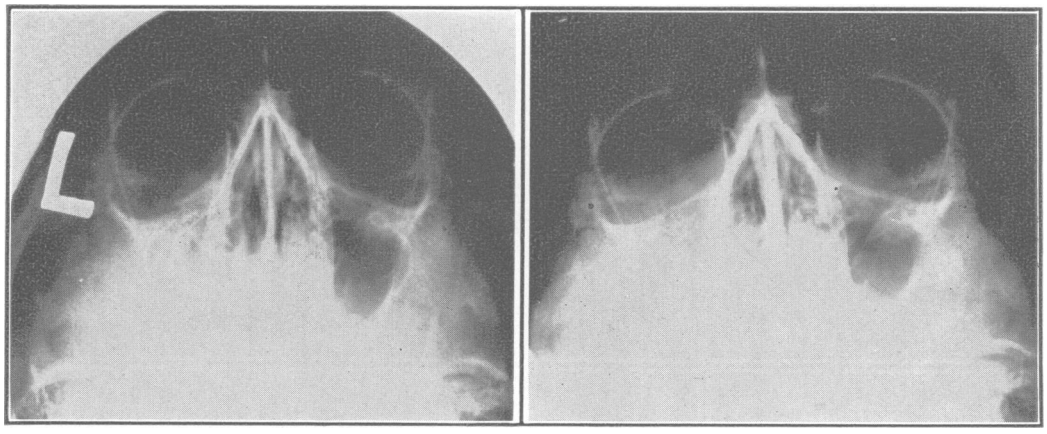


Fig. 5.—The x-ray films show a fracture of the left zygomatic bone before and after reduction and support by the metal splint.

One prerequisite is the presence of several teeth in the maxilla on the same side as the fracture. However, since the majority of these fractures occur in people under middle age, this requirement is almost always fulfilled.

* These splints are designed for the left or right side of the maxilla and are obtainable from the Provincial Laboratories.

2. The second type of fracture, in which the zygomatic arch is crumpled, is most efficiently treated by the method of Gillies in which a small incision half an inch long is made over the temporal muscle through the skin and temporal fascia. A long thin elevator is then slipped downwards on the surface of the temporal muscle until it lies deep to the displaced fragment which may be lifted into correct position by careful levering movements and external manipulation with the fingers. The elevators shown in Fig. 4 have proved very useful in this manœuvre.

3. Finally, if the zygoma is comminuted, quite frequently there is a coexisting laceration of the skin, through which the fragments may be united by drilling small holes and wiring the fragments together with No. 28 gauge stainless steel wire. Especially advantageous is the fixation which may be gained in this way in the region of the frontozygomatic suture. If no laceration of the cheek exists the fragments may be reduced as in the first type of fracture and supported by a Y-shaped prop, which may be adjusted to suit a particular case of this type. The great advantage attained by this type of splint is that no foreign body remains in the maxillary sinus to act as an irritant and cause a chronic suppurative sinusitis.

SUMMARY

1. The three main types of fracture of the zygomatic bone and arch are outlined with appropriate treatment for each.

2. A new splint is described which is adjustable to various sizes and is provided for fractures of the left or right zygoma.

3. Firm, adjustable support is obtained without resort to external incisions or insertion of foreign material into the maxillary sinus.

4. The splint may be allowed to remain in position for two to four weeks without causing discomfort or undue irritation until the callus is sufficiently strong to retain the fragments, when it may be easily removed.

5. In using the splint it is necessary that the patient should have several posterior maxillary teeth on the same side as the fractured zygoma, but this requirement is almost always fulfilled.

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THE CHOICE OF SKIN GRAFTS IN PLASTIC SURGERY

BY MAJOR JOHN W. GERRIE, R.C.A.M.C.*

No. 1 Canadian General Hospital, C.A.S.F.

WHEN a part of the body is lost there is a wide choice of both tissues and methods of grafting available for its reconstruction. Skin, cartilage, bone, nerve and fascia may be grafted with reasonable assurance of success and by a variety of procedures. Faced with a loss of tissue, one estimates its kind and amount, and plans by what tissue, and by what method, it will be restored.

The development of skin grafts has been interesting, and dramatic and many ingenious procedures have been devised. They are divided broadly into two main groups: (*a*) the free grafts, and (*b*) the pedicle grafts. Free grafts are those which are severed completely from their source of nourishment and depend for their existence on a capillary oozing of serum from the graft bed. This group includes the large thin and thick split grafts popularly known as Thiersch grafts, the small thin and thick split grafts spoken of as "pinch" grafts and the full thickness or "Wolfe" graft. It also includes the "grille"[1] and "sieve"[2] grafts recently introduced by various workers. The pedicle grafts are of greater bulk, and contain an amount of subcutaneous tissue and at no time are they separated from a carefully nursed blood supply. These are the pedicle grafts, delayed pedicle grafts, and tubed pedicle grafts.

In a study of skin grafts it is well to bear in mind the skin structure (Fig. 1). The epidermis with its squamous and basal-celled layer and papillæ, the cells of which are accustomed to receive their nourishment by capillary phenomena, contains no vessels. The derma or corium, on the other hand, contains blood vessels and the accessory skin structures in a connective-tissue reticulum. Beneath are fat, fascia, and other subcutaneous structures. With this in mind it is understandable that the thinner the graft or the more confined to epidermal structures, the greater chance it has to live by free grafting. The cells are used to living by capillary phenomena and may well do so on transfer to a slightly altered site. On the other hand the thicker grafts, containing greater amounts of derma, are more highly specialized and used to an organized blood supply, and so the thicker the graft, the more precarious it is from the standpoint of free grafting. When more than epidermis and derma are used, it becomes necessary to use the pedicle type of graft.

The *thin split skin graft.*—This is commonly known as the Thiersch or Ollier-Thiersch graft, or thin razor graft. Blair and Brown[3] introduced the terms thin and thick split skin grafts which are descriptive of splitting away the skin with a razor or knife parallel to the surface at various depths. The thin split graft aims to take away the epidermis in a tissue-paper-like sheet with little or no derma (a in Fig. 1). The donor site bleeds only in fine punctate points and heals rapidly and completely. It has a high percentage of takes and is useful in infected areas, but it is rather poor in appearance and may be glazed and shiny with no accessory skin structures. It tends to shrink and is useless where there is deep loss of tissue and scar contracture or on areas that must bear any pressure. Its greatest use is in lining mucous cavities such as the eye socket or mouth, where it seems to take on the characteristics of mucous membrane. It is cut and wrapped around a mould or stent of dental

* On leave of absence from McGill University, Montreal.